A Cost Benefit Analysis:

Proposed Regulation Amendment

Title 250 – Department of Environmental Management

Chapter 120 – Air Resources

Subchapter 05 – Air Pollution Control

Part 19 – Control of Volatile Organic Compounds from Surface Coating Operations

Rhode Island Department of Environmental Management

Office of Air Resources

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Executive Summary

The purpose of this cost benefit analysis is to determine if the proposed changes to Rhode Island Department of Environmental Management's ("RIDEM") Office of Air Resources ("OAR") Air Pollution Control Regulation 19, "Control of Volatile Organic Compounds from Surface Coating Operations," would result in significant adverse impacts on businesses in RI. The proposed changes to the regulation aim to reduce the amount of VOC released into the atmosphere than compared to the current status quo.

An in-depth analysis of all costs and benefits that could be monetized were looked at for this report. Costs that were determined are as follows; cost of environmental consultant, cost of reformulating chemicals, and more. Benefits included ground-level ozone reduction, reduction in asthma related hospital visits, avoided agricultural crop loss, and tourism value in Rhode Island. Previous studies from the USEPA and other reputable sources were used to monetize all costs and benefits possible. Some costs and benefits were not able to be monetized but should be considered an important factor in the analysis.

The results of the analysis estimated annual quantifiable costs of $22,100 and quantifiable benefits of $350,000. The annual average net benefit over the next five years is estimated to be approximately $329,000.

Introduction and Background

Part 19 is being amended to incorporate revised emissions limitations for existing surface coating categories, as well as add emissions limitations for surface coating categories not currently regulated. Compliance with the proposed emissions limitations must be achieved by July 1, 2020. The applicability threshold for existing categories and new surface coating categories of 2.7 tons per rolling 12-month period, prior to control.

The amendments include revised and new VOC content limits for paper, film and foil coating, metal furniture coating, large appliance coating, miscellaneous metal and plastic parts coating, and flat wood paneling. The proposed miscellaneous metal and plastic parts coating category contains new specific VOC content limits for automotive/transportation, business machines, and pleasure craft coatings. The VOC content limitations proposed meet and do not exceed current EPA requirements.

An economic analysis is required to determine if the proposed change to the regulation will have an impact on businesses within Rhode Island.

<u>Emissions Cap Option</u>

A factor to take into consideration with the proposed changes of Part 19, is the option to limit emissions as stated in 19.6.9.C.:

> "Any surface coating facility which has actual emissions greater than or equal to 2.7 tons per rolling 12-month period in any one of the surface coating categories in §§ 19.6.1 through 19.6.8 of this Part may apply to the Director for exemption from § 19.7 of this Part. Exemption will be given in the form of an enforceable document, and will include the following conditions:
>
> 1. The total emissions from all surface coating operations shall not exceed 1,666 pounds in any one calendar month,
> 2. The facility shall maintain the following records at the facility for a period of five (5) years. This information shall be made available to the Department and EPA upon request:
>   a. The name, identification number and amount used each month of each coating, as applied, on each coating line or operation;
>   b. The mass of VOC per volume (excluding water), as applied, for each coating used on each coating line or operation;
>   c. The type and amount of solvent used for diluents and cleanup operations;
> 3. The limit in §19.6.9(C)(1) of this Part is exceeded, the applicable emissions limitations specified in § 19.7 of this Part will immediately apply.

These are also referred to as "Emissions Caps," which are administered by the Office of Air Resources. This is an option that facilities can explore if proposed changes to Part 19 would result in any negative impacts to their business. Many companies within Rhode Island do not emit enough pollutants through surface coating operations to be considered major sources, and most would be able to apply for the emissions cap option, if they haven't already.

Objectives

Economic Impact on Businesses within Rhode Island

Outside Analysis

All Control Technique Guidelines were analyzed for this analysis, but a few are summarized below.

United States Environmental Protection Agency ("USEPA")

Office of Air Quality Planning and Standards

Control Techniques Guidelines for Flat Wood Paneling Coatings

September 2006 (EPA (1))

In September 2006, the USEPA released a report to provide information to air pollution control authorities that can assist them in determining RACT for VOC from surface coating operations, specifically flat wood paneling. The USEPA evaluated (EPA (1)) the sources of VOC emissions in this industry and the available control techniques for addressing these emissions. It is recommended that the control approached discussed in the report apply to each flat wood paneling facility that emit at least 6.8 kg/day (15 lb./day) of VOC before consideration of controls. The analysis and control techniques evaluated in this report were incorporated to the changes proposed in Part 19, "Control of Volatile Organic Compounds from Surface Coating Operations," by RIDEM's Office of Air Resources.

USEPA conducted a cost effectiveness analysis to determine if the recommended control options were feasible to the flat wood paneling facilities in the U.S. It was determined that of the 80 facilities identified, 24 of these companies would meet the 15 lb. of VOC per day applicability threshold for the CTG (pg.3). It should be noted that none of the 24 facilities identified by the USEPA are in Rhode Island. The USEPA recommends emission limits for the inks, coatings, and adhesives used in flat wood paneling coating facilities (pg. 9).

1. Low-VOC Coatings for Inks, Coatings, and Adhesives
    a. Low-VOC limit of 250 g GOC/1 (2.1 lb./gal) of material (minus water and exempt compounds.) Equivalent limit, 350 g/l (2.9 lb./gal of solids.)
2. Optional Add-On Controls for Inks, Coatings, and Adhesives
    a. Should product performance requirements/other needs dictate the use of high-VOC coatings, a facility can choose to use add-on control equipment to limit VOC (overall control efficiency of 90%). These include equipment such as oxidizers and solvent recovery systems.
3. Work Practices
    a. Practice plan established to minimize VOC emissions from mixing operations, storage tanks/other containers, and handling operations for coatings, thinner, cleaning materials, and waste materials. Work practice standards include: storing all VOC coatings, thinners, and cleaning materials in closed containers, minimizing spills of VOC containing coatings, thinners, and cleaning up spills immediately, etc.

All these options are viable to facilities under the threshold outlined in the CTG, and most likely will already have one or more of these options already in place. The report outlines that surface coating from flat wood paneling was covered in the NESHAPs. One of the options in the NESHAP includes the use of low-HAP materials. It was noted that most facilities in compliance with the NESHAPs in terms of HAPs, are also most likely in compliance in terms of VOCs.

The USEPA concluded that although there are some costs associated with changing to low-VOC coatings, or installing add-on control equipment, the costs are not very significant. Again, it should be noted that this analysis conducted did not cover a facility example in Rhode Island.

United States Environmental Protection Agency ("USEPA")

Office of Air Quality Planning and Standards

Control Techniques Guidelines for Metal Furniture Coatings

September 2007, (EPA (2))

In September 2007, the USEPA released a report to provide information to air pollution control authorities that can assist them in determining RACT for VOC from surface coating operations, specifically metal furniture coatings. The USEPA evaluated (EPA (2)) the sources of VOC emissions in this industry and the available control techniques for addressing these emissions. It is recommended that the control approached discussed in the report apply to each metal furniture coating facility that emit at least 6.8 kg/day (15 lb./day) of VOC before consideration of controls. The analysis and control techniques evaluated in this report were incorporated to the changes proposed in Part 19, "Control of Volatile Organic Compounds from Surface Coating Operations," by RIDEM's Office of Air Resources.

Similar to the CTG for Flat Wood Paneling (EPA (1)), the USEPA studied the different areas of emissions from metal furniture coatings throughout the country. 456 metal furniture surface coating companies were identified, with 143 facilities located in nonattainment areas emit more than the 15 lb./day VOC threshold. The sources of VOCs from metal furniture coating operations come from the coatings and cleaning materials used. Recommended control options outlined in the CTG were use of low-VOC coatings, combination of low-VOC coating and add-on controls, or add-on controls with control efficiency of 90% (pg. 22). It is estimated that these recommendations will reduce VOC emissions from this industry by 35% from the 143 facilities identified.

The cost-effectiveness of the recommended control options was discussed within the report. The EPA assumed that all affected sources would choose the low-VOC content coating materials alternative, as it is the less costly option. This was also assumed because low-VOC coating materials are already widely available at a cost that is not significantly greater than the cost of high-VOC coatings.

Many of the CTGs reviewed all had the same conclusions that there are no significant costs associated with control options recommended for the surface coating industry.

Alternatives

The Department is required by the EPA to adopt updated VOC content limits in line with Control Technique Guidelines and adopt reasonably available control technology (RACT) as Rhode Island as part of the Ozone Transport Region. The Department has proposed to give entities the full suite of compliance alternative options, with the option to request an alternative compliance method. Therefore, the Department is not requiring an entity to choose any compliance alternative over another, allowing businesses greater flexibility with how to meet VOC content limits.

Assumptions

The table below includes all assumptions for this analysis.

Assumptions	**Value**
Discount Rate	3% Benefits; 7% Costs
Lifetime	5 Years

A benefit discount rate of 3% and a cost discount rate of 7% is used for this analysis as based upon the EPA Regulatory Impact Analysis (EPA (3)) that was conducted in July 2008. This discount rate was widely used among many analyses that have to do with air quality standards for ozone.

A project lifetime of 5 years was used to ensure that all costs and benefits can be represented effectively in the analysis.

Analysis

Compliance Options

There are different compliance options that companies can choose to meet compliance requirements outlined in Part 19. Facilities with actual emissions before controls are greater than or equal to 2.7 tons per rolling 12-month period, VOC per day have a few options to comply with requirements of Part 19. Many of the options are the same for the different categories, such as low VOC content coatings and daily weighted averages. Below is the breakdown of each type. The different compliance options per category are as follows for all or most coatings outlined in the regulation.

1. Use only low-VOC coatings that have an as applied VOC content as specified in the regulation.
2. Use a combination of low-VOC coatings and add on control equipment meeting the as applied VOC content as specified in the regulation.

3. Use of daily-weighted averaging to achieve the VOC content limits.
4. In lieu of the use of low-VOC coatings, in accordance with the requirements of Part 9 (Air Pollution Control Permits), install an approved control system to achieve an overall VOC control efficiency of at least 90%.

These different options allow companies who would be subject to emissions limitations outlined in Part 19 to pick which method fit their business practices best. Specific VOC content limits differ by category but are all outlined within the regulation. It is assumed that businesses would choose the least costly option that would allow them to be in compliance with terms of Part 19.

Emissions Limitations – Proposed Changes

The proposed change to Part 19 include emissions limitations that have been updated to reflect the USEPA's CTGs. These include expanding upon the previous emissions limitations to include the different types of coatings that may be associated with the categories outlined in Part 19. (Such coating types for metal furniture, miscellaneous metal parts, etc. with specific VOC limit per type of coating.) There are many emissions limitations outlined in the regulation, and they are explained in depth within the Fact Sheet for Part 19. As analyzed by the USEPA in the CTGs for surface coating operations, and in this report, it is assumed that there is little to no cost. Many of the costs analyzed were in regard to installing pollution control equipment. In this cost benefit analysis, it is assumed that companies would not chose this option, as it would be the costliest. The other options outlined in the regulation would be more cost effective to use.

Proposed Work Practice Standards

Proposed work practice standards for surface coating and cleaning operation have been added to the rule to minimize VOC emissions. These standards include:

1. Storing all new and used VOC-containing cleaning materials. coating, thinners or coating related waste, including used shop towels, in closed containers;
2. Ensuring that mixing and storage containers used for VOC-containing cleaning materials, coatings, thinners, and coating-related waste materials are kept closed at all times except when depositing or removing these materials;
3. Minimizing spills of VOC-containing cleaning materials, coatings, thinners, and coating-related waste materials;
4. Conveying VOC-containing cleaning materials, coatings, thinners, and coating-related waste materials from one location to another in closed containers or pipes; and
5. Minimizing VOC emissions from cleaning of application, storage, mixing, and conveying equipment by ensuring that equipment cleaning is performed without atomizing the cleaning solvent and all spent solvent is captured in closed containers.

Proposed Accepted Application Methods

The proposed rule contains acceptable application methods for miscellaneous metal and plastic parts coating, large appliance coating, and metal furniture coating. Acceptable methods include the use of:

- Electrostatic spray application;
- HVLP spray;
- Flow coat;
- Roller coat;
- Dip coat, including electrodeposition;
- Airless spray;
- Air-assisted airless spray; or
- A coating application method capable of achieving a transfer efficiency equivalent to or greater than that achieved by HVLP, as approved by the Director and EPA.

Analysis of Impacts – Costs

The categories of costs detailed below were evaluated over five years and discounted back at a rate of 7% to get the average annual cost of $22,000. Each cost was adjusted to indicate projected timeframes as explained below. See Appendix D for the assumed costs in each year from the methodology below.

Cost of Installation of Air Pollution Control Equipment

Based upon the information that Office of Air Resources has on the surface coating companies within Rhode Island, it is assumed that no companies would need to install air pollution control equipment in order to comply with proposed changes to Part 19. Therefore, this cost is not calculated in this analysis. Companies that do not have air pollution control equipment, can comply with terms of the regulation by the different options outlined in Part 19. This includes options such as use of low-VOC content coating or daily-weighted averaging of emissions. It is assumed that companies will choose the most cost-effective option for their operations.

Cost of Environmental Consultant Work

If a facility is affected by the proposed changes to Part 19, then an environmental consultant might be needed to assist in emissions calculations, permit changes, etc. Some companies choose to have full-time employees in charge of environmental compliance, which would result in little to no cost to the facility. An opportunity cost is considered later in this analysis. On the other hand, the companies without full-time employees incur a cost hiring an

environmental consultant for a period of time until a facility is in compliance with changes to Part 19. This is considered a potential cost to a small amount of facilities within the state, as many companies may not need to take any action regard the proposed changes to Part 19. The average time a consultant could be hired for a time span of 2 work days to a full work week, (16-40 hours). Based upon wages found by CSC Systems & Solutions, an environmental consultant can be hired at a price of $42 to $149 per hour depending on title (CSC pg. 12). This wage gap can drop below $41 and increase higher than $149 based upon skill level, although most companies hire middle range consultants. An average of this wage range of 12 different consultant titles calculates to $119.80 per hour. This will be the potential hourly wage used for the cost of hiring a consultant to work for a company in regard to changes to Part 19. The high and low range is calculated below.

16 hours x $119.80= $1916.80

40 hours x $119.80 = $4792.00

The average of this calculation will be used as the potential cost to companies, which equates to $3354.40. A conservative value of 10 companies will be used for this calculation. The final value found is $33,544.00. This number will be used in the net present value calculation. This value is considered an initial cost. The cost is assumed in 2020, as it would most likely occur after the regulation is put into effect.

Cost of Reformulation of Processes

In the case that a company would not be in compliance with proposed changes of Part 19, then a cost of reformulating the surface coating process is possible. It is considered a potential cost though, since it is the assumption that very few facilities will be significantly affected by the proposed changes to Part 19. The USEPA analyzed costs in their CTGs for the various types of surface coating operations. All concluded that there were no significant costs to the recommended control options. It was also mentioned among the different studies that the control options outlined were similar to the 2003 NESHAP cost estimates. Therefore, many facilities affected by the VOC limitations, may not incur any costs if they are already complying with the 2003 NESHAPs. The 2003 NESHAPs recommended control options for HAPs that are similar to the recommendations in the CTGs. This USEPA determined that any costs that would be incurred to facilities would be if no control options were already in use. The range between the different CTGs were between $1,400 to $11,700 in $2018. The average value will be used to calculate initial cost to facilities. The value of $6,000 will be used in the net present value calculation. The same company total of 10 will be used for an initial cost of $60,000. The reformulation would happen in the implementation year, 2019, as companies would need to assess if permits are needed to comply with the regulation.

Cost of Low-VOC Content Coatings

One of the options outlined in Part 19 includes switching to lower-VOC content coatings in order to comply with emissions limitations. Since the USEPA wrote the CTGs for the various types of surface coating covered in the regulation, low-VOC options have become widely available. Manufacturers of coating materials have had time to reformulate and come into compliance with emission limitations. This would allow many companies who are in the surface coating industry to already be in compliance with emissions limitations set by the regulation.

Air Pollution Inventories that are sent to the OAR were reviewed for examples in this analysis. Many different surface coating facilities report to the OAR every year with VOC calculations and product use for the year. One company that would qualify under surface coating for miscellaneous metal parts and plastic parts, reports using mostly Sherwin Williams brand paint. Sherwin Williams does not sell paint (for coatings) with any higher VOC level than 2.80 lb./gal. Therefore, this company would be in compliance with new emissions limitations without needing to purchase new types of paint/coatings. It is assumed that many of the companies would have very few coating materials that would be out of compliance. With VOC limits becoming more stringent around the country, manufacturers of these products are not going to create multiple formulas to meet different emission limitations. One formula will be created to meet the most stringent limitation, thus making compliance easier for most companies.

In one case with one company the emissions limitations, antifoulant coating prices were studied. Many different antifoulants are sold by Jamestown Distributors that have various VOC contents. Of all the products listed on their website, very few have high-VOC content that would be out of compliance with the regulation. From the few that did have high-VOC content, that did not already have a permit with Air Resources, when compared to the low-VOC content products, there is an estimated price different of $10-$30 per quart. It is difficult to calculate a precise value as many of the air inventories looked at were already using compliant products. It is possible that some coatings that need to be repurchased with lower VOC contents, so a value will be calculated for this analysis. Based upon the data reported, there may be 4-5 types of products used that are out of compliance. The data received in office shows that companies that may use it of compliant coatings, may use around 3-5 quarts of it a year. Using a value of 3 quarts or 4 different types of coating, the total marginal cost of purchasing lower VOC coating can be $120-$360. The 10-facility value will also be used for this cost, using the higher value of $360, the total annual cost will be $3,600. This is an annual cost after the implementation of the regulation would be observed at half-value in 2020 and at full value in subsequent years.

Opportunity Cost & Time Lost

In the case that a facility would need to work on permit applications, emissions calculations, or any other form of work associated with the changes to Part 19, an opportunity cost is considered. For facilities that have full-time environmental staff, new work may result in putting aside other duties or responsibilities of the individual. However, once knowledge is

learned, it is assumed that work can take little time, and will not cause any significant cost to companies. An estimated time of 16-40 hours can be possible timeframes it can take for knowledge to be learned for a period of 1 year. It is assumed that after a 1-year period, the required work will be standard practice for the position. The U.S. Bureau of Labor Statistics found that an Environmental Scientist/Specialists hourly wage is $34.20. For 16 hours, it could cost $547.2, and for up to 40 hours it could cost $1,368. The average value of $957.6 will be used for 10 facilities, for a 1-year cost of $9,576. This cost was adjusted to occur in the second half of 2020 and in the first half of 2021 after the regulation is put into effect. This is assuming the timeframe it would take to adjust to the new work practice.

Analysis of Impacts – Benefits

Quantifiable Benefits

Improved Air Quality (Improved Health and Welfare of Public) - Ozone

The proposed changes to the current regulation, would continue to reduce ground-level ozone formation. Ground-level ozone, a hazard to public health and welfare, is not emitted directly from the processes of surface coating operations but is formed by a photochemical reaction between VOCs and NOx in the presence of sunlight.

The EPA regulates ground-level ozone as a criteria air pollutant due to its widespread adverse health and environmental effects. High exposure can lead to serious human and animal health and welfare threats, complications include respiratory illnesses and decreased lung function, agricultural crop loss, foliar injury to sensitive plant species, and damage to forests, ecosystems and infrastructure (PA DEP pg. 4). Implementing the proposed changes/updates to Regulation 19 would positively benefit the population of Rhode Island, but also downwind states and environments.

The EPA conducted a Regulatory Impact Analysis – Final Ozone National Ambient Air Quality Standard (NAAQS) Regulatory Impact Analysis (RIA) in March 2008 (EPA (3)) which found cost and benefits associated with reducing tropospheric ozone by decreasing both VOC and NOx emissions. The benefits analysis for this rule relies on the EPA's RIA benefits calculations for changing the ozone standard from a 0.080 ppm to 0.070 ppm (current standard). EPA has determined it to be annually recurrent. Because this analysis will not venture to estimate the benefit of reducing current ozone ppm levels to the 0.070 standard, but will instead scale the annual benefit found by EPA to more recent times for Rhode Island only, the 2008 study will be used instead of the 2011. (Currently the 8-hour ozone standard for Rhode Island is 0.070 ppm.)

EPA relied upon several studies and meta-analyses to estimate the benefits associated with reducing tropospheric ozone levels. The following categories of benefits are included in the EPA's annual estimate: reducing risk of premature death, avoidance of respiratory and asthma-related hospital admissions and emergency room visits, reduction in school absences, less restriction of outdoor activity days, etc. Asthma related healthcare costs are of particular concern in Rhode Island. The Rhode Island Department of Health (RIDOH) estimates that more than 45,000 insured Rhode Islanders are affected by asthma, spending $477 million for asthma-related healthcare in 2014 (RIDOH).

To estimate the benefits attributable to VOC reductions in Rhode Island as a result of this regulation, the Department scales the EPA's $12.1 billion[1] annual benefits estimate in 2020 from the 2008 RIA. The EPA estimate is scaled by: the ratio of VOC and NOx emissions seen in Rhode Island compared to nationally observed emissions[2]; the percentage of VOC emissions reasonably attributed to the sources impacted by the regulation; and an estimate of what percentages of Rhode Island firms might be impacted by the regulation. The analysis also assumes that benefits will begin accruing at the time of the proposed compliance date: July 1, 2020. For the description of benefits estimates assumptions, see Appendix C.

This methodology yields an average annual benefit over the next five years of approximately $350,000.

Non-Quantifiable Benefits

Avoided Crop Loss – Agriculture in RI

VOCs are a contributing factor to ground-level ozone creation, which has a negative effect on agriculture. Though the Department did not attempt to quantify the effects associated with reduction of VOC emissions on the Rhode Island agricultural industry, the EPA estimates that the benefits of reducing ozone exposure on the agricultural industry would result in $499.98 million to $774.97 million 2018$. High concentration of ozone can result in crop yield loss from both reduced seed production and visible injury to some leaf crops (PA DEP pg.5). Currently the number of farms according to the Rhode Island Department of Environmental Management's Division of Agriculture, there are 1,243 farms in the state (RIDEM Agriculture). Agricultural numbers are increasing in New England when compared to the rest of the country.

Economic Value of Rhode Island Tourism

The tourism and hospitality industries are Rhode Island's largest economic sectors, providing thousands of jobs and significant amounts of revenue for the state. States that rely on natural resources for revenue are the most vulnerable to the effects of climate change. The goal

1 See Appendix C for EPA estimates assumptions, which includes a built-in 3% discount rate.
2 The analysis does not attempt to estimate the ratio of benefits attributable to a reduction of VOC emissions alone as the relationship of VOC and NOx reductions on the impact of tropospheric ozone varies greatly by area.

of any environmental regulation that limits any form of harmful chemical being emitted into the atmosphere, besides human/animal health as previously discussed, is to prevent further damage to the environment. Continuing to protect the environment results in a continuation of a healthy environment for years to come, but also an upkeep of jobs and revenue for the state. In a 2010 study by the RI Economic Development Corp., tourism and in-state visitor spending generated $2.3 billion for the state and provided $845 million in wages and salaries (RI Climate pg. 1). These values show significant reliance on the natural resources RI has and the importance of protecting them. Some other values found in the 2010 study;

a) Without tourism, households may pay up to $1,349 more in taxes to maintain current level of state and local tax receipts.
b) Each visitor creates about $134 in tax receipts, $78 to state & local authorities.
c) 185 visitors result in enough funds for one RI public school for a year.
d) Each RI visitor generates $481 in expenditures, $96 which go to RI businesses.
e) Each visitor adds about $235 to RI Gross State Revenue.

As seen by these values found, it is extremely important to preserve and protect the natural resources within Rhode Island. Regulations that deal with the limit of VOC emissions, such as part 19, play an important part in protecting the environment. A sustained environment in Rhode Island is beneficial to the businesses that rely on it, along with the residents and visitors who enjoy it.

There are multiple values in this example that can be considered benefits for this analysis but will not be used in the final calculation. The values found by the 2010 study can be considered constant benefits for the state. As Part 19 would allow for the continuous economic state for businesses, the value of $2.3 billion cannot be directly calculated as a total benefit. Part 19 plays a role in the total value of the revenue the state receives from tourism and hospitality, but that value cannot be calculated at this time. These values outlined should be considered in the final analysis as further evidence that Part 19 does not create an adverse impact on businesses within the state.

Discounting Present Value

All monetary values were converted to 2018$. 2018 is being used as it is the most current full-year of data available. Costs were calculated using a discount rate of 7% and benefits were calculated using a 3% discount rate.

Net Present Value Calculation – Net Benefits

The results of the analysis estimated annual quantifiable costs of $22,100 and quantifiable benefits of $350,000. The annual average net benefit over the next five years is estimated to be approximately $329,000.

Recommendation

It is recommended that the proposed changes to Part 19 be put into effect. The analysis determined that the proposed rule justify the costs associated, as the net-benefits are greater. The proposed rule will achieve the objectives of the authorizing statue in the most cost-effective manner as outlined in the analysis.

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Appendix A – Definitions

1. "Actual Emissions" means the quantity of volatile organic compounds emitted from a source during a particular time period.

2. "Adhesion primer" means a coating that is applied to a polyolefin part to promote the adhesion of a subsequent coating. An adhesion prime is clearly identified as

an adhesion prime or adhesion promoter on its accompanying material safety data sheet.

3. "Air-dried coating" means a coating that is dried by the use of air or forced warm air at temperatures up to ninety degrees Celsius (90ºC) or one hundred and ninety-four degrees Fahrenheit (194ºF).

4. ‘‘Airless spray application’’ means a coating spray application system using high fluid pressure, without compressed air, to atomize the coating.

5. ‘‘Air-assisted airless spray application’’ means a coating spray application system using fluid pressure to atomize the coating and low-pressure air to adjust the shape of the spray pattern.

6. ‘‘Antifouling coating’’ means a coating applied to the underwater portion of a pleasure craft to prevent or reduce the attachment of biological organisms and registered with the United States Environmental Protection Agency (EPA) as a pesticide under 7 U.S.C. § 136 (Federal Insecticide, Fungicide, and Rodenticide Act).

7. ‘‘Antifouling sealer or tie coat’’ means a coating applied over biocidal antifouling coating for the purpose of preventing release of biocides into the environment or to promote adhesion between an antifouling coating and a primer or another antifouling coating.

8. “As-applied” means the composition of coating at the time it is applied to a substrate, including any solvent, catalyst or other substance added to the coating as supplied by the manufacturer calculated using the procedure in §19.13(A) or (B).

9. “Baked” means cured at a temperature at or above ninety degrees Celsius (90ºC) or one hundred ninety-four degrees Fahrenheit (194ºF).

10. ‘‘Business machine’’ means a device that uses electronic or mechanical methods to process information, perform calculations, print or copy information or convert sound into electrical impulses for transmission, including devices listed in standard industrial classification numbers 3572, 3573, 3574, 3579, and 3661 and photocopy machines, a subcategory of standard industrial classification number 3861.

11. ‘‘Camouflage coating’’ means a coating used, principally by the military, to conceal equipment from detection.

12. “Capture efficiency” means the ratio of VOC emissions delivered to the control device to the total VOC emissions resulting from the coating and related cleaning, expressed as a percentage.

13. "Class II hardboard paneling finish" means finishes that meet the specifications of Voluntary Product Standard PS-59-73 as approved by the American National Standards Institute.

14. "Clear coating" means a coating which lacks color and opacity or is transparent and which uses the undercoat as a reflectant base or undertone color.

15. ‘Coating’’ means a material that is deposited in a thin, persistent, uniform layer across the surface of a substrate for aesthetic, protective or functional purposes, including but not limited to, paints, primers, inks and maskants.

    a. ‘‘Coating’’ does not include protective oils, acids and bases.

16. "Clear wood finishes" means a clear and semi-transparent topcoat applied to a wood substrate to provide a transparent or translucent film.

17. "Coating applicator" means a device, mechanism, or apparatus used to apply a surface coating. Common types of application techniques include knife, roll, spray or dip.

18. "Coating of plastic parts of automobiles and trucks" means the coating of any plastic part that is or shall be assembled with other parts to form an automobile or truck.

19. "Coating of plastic parts of business machines" means the coating of any plastic part that is or shall be assembled with other parts to form a business machine.

20. "Coating unit" means a series of one or more coating applicators and any associated drying area and/or oven wherein a coating is applied, dried, and/or cured. A coating unit ends at the point where the coating is dried or cured, or prior to any subsequent application of a different coating. It is not necessary for a coating unit to have an oven or flash-off area.

21. "Coil coating" means the application of a coating to any continuous metal strip with thickness of 0.006 inch or more that is packaged in a roll or coil.

22. “Dip coating” means a method of applying a coating to a surface by submersion into and removal from a coating bath.

23. "Drum" means any cylindrical metal shipping container of 13- to 110-gallon capacity.

24. ‘‘Electric dissipating coating’’ means a coating that rapidly dissipates a high-voltage electric charge.

25. “Electric-insulating and thermal-conducting coating” means a coating that displays an electrical insulation of at least one thousand (1000) volts DC per mil on a flat test plate and an average thermal conductivity of at least 0.27 BTU per hour-foot-degree-Fahrenheit.

26. "Electric-insulating varnish" means a non-convertible-type coating applied to electric motors, components of electric motors, or power transformers, to provide electrical, mechanical, and environmental protection or resistance.

27. “Electrostatic application” means a method of applying coating particles or coating droplets to a grounded surface by electrically charging such particles or droplets.

28. "Electrostatic prep coat" means a coating that is applied to a plastic part solely to provide conductivity for the subsequent application of a prime, a topcoat, or other coating through the use of electrostatic application methods. An electrostatic prep coat is clearly identified as an electrostatic prep coat on its accompanying material safety data sheet.

29. ‘‘EMI/RFI shield coating’’ means a coating that functions to attenuate electromagnetic interference, radio frequency interference signals or static discharge.

30. "Emission baseline" means a level of emissions calculated by multiplying two factors:

    a. The lowest of the source's actual or allowable emission rate in emissions per unit of production; and,

    b. The source's actual capacity utilization, or units of production, over some representative time period. Generally, the time period is the preceding

two-year average unless the source can demonstrate that those years were not representative of historical production.

31. ‘‘Etching filler’’ means a coating that contains less than twenty-three percent (23%) solids by weight and at least 0.5% acid by weight and is used as a substitute for the application of a pretreatment coating followed by a primer.32.

“Extreme high gloss coating” means a coating that, when tested by the most recent active version of the American Society for Testing Material Test Method D523, shows a reflectance of seventy-five (75) or more on a sixty (60) degree meter.

33. "Extreme performance coatings" means coatings intended for exposure to any of the following; outdoor weather conditions all of the time, temperatures frequently above ninety-five degrees Celcius (95ºC) of two-hundred and three degrees Fahrenheit (203ºF), detergents, abrasive and scouring agents, solvents, corrosive atmospheres, or similar environmental conditions.

34. “Fabric coating” means the coating of a textile substrate with a knife, roll or rotogravure coater to impart properties that are not initially present, such as strength, stability, water or acid repellency, or appearance.

35. ‘‘Finish primer or surfacer’’ means a coating applied with a wet film thickness of less than ten (10) millimeters prior to the application of a topcoat for purposes of providing corrosion resistance, adhesion of subsequent coatings, a moisture barrier or promotion of a uniform surface necessary for filling in surface imperfections.

36. "Flatwood paneling coating" means the application of a coating to flat wood panels including: printed interior panels made of hardboard plywood and thin particle board (i.e., less than or equal to 0.25 inches in thickness) natural finish hardboard plywood panels; and hardboard paneling with Class II finishes.

a. Flatwood paneling does not include: Class I hardboard panels, particle board used in furniture or wood products, insulation board, exterior siding, tile board, and soft wood plywood coating lines.

37. "Flexible coating" means any coating that is required to comply with engineering specifications for impact resistance, mandrel bend, or elongation as defined by the original equipment manufacturer.

38. ‘‘Flexible primer’’ means a primer with elastomeric qualities that provides a compatible, flexible substrate over bonded sheet rubber and rubber-type coatings.

39. “Flow coating” means a non-atomized technique of applying coating to a substrate using a fluid nozzle in a fan pattern with no air supplied to the nozzle.

40. ‘‘Fog coat’ ’means a coating that is applied to a plastic part at a thickness of no more than 0.5 mils of coating solids for the purpose of color matching without masking a molded-in texture;

41. "Gloss reducer" means a coating that is applied to a plastic part solely to reduce the shine of the part. A gloss reducer shall not be applied at a thickness of more than 0.5 mils of coating solids.

42. "Hardboard" means a panel manufactured primarily from inter-felted ligno-cellulosic fibers that are consolidated under heat and pressure in a hot press.

43. "Hardwood plywood" means plywood whose surface layer is a veneer of hardwood.

44. “Heat-resistant coating” means a coating that is required to withstand a temperature of at least 204.5° C (400°F) during normal use.

45. "High build primer or surfacer’’ means a coating applied with a wet film thickness of ten (10) millimeters or more prior to the application of a topcoat for purposes of providing corrosion resistance, adhesion of subsequent coatings, a moisture barrier or promotion of a uniform surface necessary for filling in surface imperfections.

46. "High-gloss coating" means a coating that achieves at least eight-five percent (85%) reflectance on a sixty (60) degree meter when tested by ASTM Method D-523.

47. "High-temperature coating" means a coating that during normal use must withstand a temperature of at least four hundred twenty-six degrees Celsius (426°C) of eight-hundred degrees Fahrenheit (800°F).

48. “HVLP spray application” means to apply a coating using a high-volume, low-pressure spray application system that is designed to operate at air pressures between 0.1 and 10 pounds per square inch gauge, measured dynamically at the center of the air cap and the air horns.

49. “Knife coating” means the application of a coating material to a substrate by means of drawing the substrate beneath a knife that spreads the coating evenly over the full width of the substrate.

50. "Large appliance coating" means the application of a coating to the surface of component metal parts (including, but not limited to, doors, cases, lids, panels and interior parts) of any residential or commercial washer, dryer, freezer, range, refrigerator, water heater, dishwasher, trash compactor, air conditioner, or other similar products under Standard Industrial Classification Code 363.

    a. Large appliance coating does not include the use of quick drying lacquers for repair of scratches and nicks that occur during assembly, provided that the volume of coating does not exceed 0.25 gallons in any one 8-hour period.

51. "Magnet wire coating" means the application of a coating in which an electrically insulating varnish or enamel is applied onto the surface of a wire for use in electrical machinery.

52. "Metal furniture coating" means the application of a coating to any furniture piece made of metal or any metal part that will be assembled with other metal, wood, fabric, plastic, or glass parts to form a furniture piece including, but not limited to, tables, chairs, waste baskets, beds, desk, locker, benches, shelving, file cabinets, and room dividers.

53. “Metallic coating” means a coating that contains more than five (5) grams of metal particle per liter of coating, as-applied;

54. "Military specification coating" means a coating which has a formulation approved by a United States Military Agency for use on military equipment.

55. "Miscellaneous metal and plastic parts coating" means a coating applied to the surface of a varied range of metal and plastic parts and products constructed either entirely or partially from metal or plastic These miscellaneous metal products and plastic parts include, but are not limited to, metal and plastic components of the following types of products as well as the products themselves:

    a. Automotive or transportation equipment;

    b. Bicycles and sporting goods;

c. Construction equipment;

d. Electronic equipment;

e. Extruded aluminum structural components;

f. Fabricated metal products (metal covered doors, frames, etc.);

g. Interior or exterior automotive parts;

h. Laboratory and medical equipment;

i. Lawn and garden equipment;

j. Motor vehicle accessories;

k. Recreational vehicles;

l. Pleasure craft or recreational boats;

m. Small and large farm machinery (harvesting, fertilizing and planting machines, tractors, combines, lawn and garden tractors, lawn mowers, rototillers, etc.);

n. Small appliances (fans, mixers, blenders, crock pots, dehumidifiers, vacuum cleaners, etc.);

o. Commercial machinery (business machines. office equipment, computers and auxiliary equipment, typewriters, calculators, vending machines, etc.);

p. Toys;

q. Steel drums; and

r. Metal pipes.

s. Miscellaneous metal or plastic parts or product coating does not include:

(1) Aerospace coating;

(2) Automotive refinishing subject to Part 30 of this Subchapter (Control of Volatile Organic Compounds from Automobile Refinishing Operations);

(2) Architectural and industrial maintenace coating subject to Part 33 of this Subchapter (Control of VOC from Architectural Coatings and Industrial Maintenance Coatings);

(3) Wood furniture coating subject to Part 35 of this Subchapter (Control of Volatile Organic Compounds and Volatile Hazardous Air Pollutants from Wood Products Manufacturing Operations);

(4) Industrial adhesives and sealants subject to Part 44 of this Subchapter (Control of VOC from Adhesives and Sealants);

(5) Can, coil, large appliance, magnet wire, and metal furniture coating and cleaning operations subject to specific separate requirements in Part 19;

(6) Fiberglass boat manufacturing materials subject to Part 51 of this subchapter (Control of Volatile Organic Compound Emissions from Fiberglass Boat Manufacturing);

(a) Specifically, the miscellaneous metal products and plastic parts categories do not include gel coats applied to fiber-reinforced plastic (fiberglass composite) products removed from the mold or used as in-mold coatings in the production of fiberglass parts and body fillers and putties used to repair surface defects in fiberglass composite parts, or putties used to bond fiberglass composite parts together. These putties are part of the composite structure and are not coatings.

(7) Automobiles and light-duty truck assembly coatings;

(8) Shipbuilding and ship repair facilities;

(8) Coating applied to test materials, test panels and coupons in research and development, quality control or performance testing.

56. "Multi-colored coating" means a coating packaged in a single container and applied in a single coat which exhibits more than one color when applied.

57. "Multicomponent coating" means a coating which is packaged in two or more parts, which parts are combined before application, and where a coreactant from

one part of the coating chemically reacts, at ambient conditions, with a coreactant from another part of the coating.

58. "Natural finish hardwood plywood panels" means panels whose original grain pattern is enhanced by essentially transparent finishes frequently supplemented by fillers and toners.

59. “One-component coating” means a coating that is ready for application as packaged for sale, except for the addition of a thinner to reduce the viscosity.

60. "Optical coating" means a coating applied to an optical lens.

61. “Overvarnish” means a coating applied directly over ink to reduce the coefficient of friction, to provide gloss or to protect the finish against abrasion and corrosion.

62. "Oven" means a chamber within which heat is used to bake, cure or polymerize and/or dry a surface coating.

63. "Pail" means any cylindrical metal shipping container with a capacity of greater than or equal to one (1) and less than thirteen (13) gallons and constructed of 29-gauge (0.0141 inches) and heavier material.

64. "Pan-backing coating" means a coating applied to the surface of pots, pans, or other cooking implements that are exposed directly to a flame or other heating elements.

65. “Paper, film and foil coating” means the application of a continuous layer of coating across the width or any portion of the width of a paper, film or foil substrate to:

    a. Create a functional or protective layer;

    b. Saturate a substrate for lamination; or

    c. Provide adhesion between two substrates for lamination.

    d. Paper film and foil coating does not include:

        (1) Coating performed on or in-line with any offset lithographic, screen, letterpress, flexographic, rotogravure, or digital printing press is part of a printing process.

66. “Pleasure craft” means any marine or freshwater vessel manufactured or operated primarily for recreational purposes.

67. "Pleasure craft coating” means any marine coating, except unsaturated polyester resin (fiberglass), applied to a pleasure craft or to parts and components of a pleasure craft.

68. ‘‘Pretreatment wash primer’’ means a coating, containing at least 0.1 percent acid by weight and no more than twenty-five percent (25%) solids by weight, that is used to provide surface etching and is applied directly to fiberglass and metal surfaces to provide corrosion resistance and adhesion of subsequent coatings.

69. “Pressure sensitive adhesive” means adhesive that forms a bond when pressure is applied, without activation via solvent, water or heat.

70. “Pressure sensitive tape and label coating” means the application of a pressure sensitive adhesive to a paper, film or foil substrate.

71. “Pretreatment coating” means a coating, containing no more than twelve percent (12%) solids by weight and at least one-half percent (0.5%) acid by weight, applied directly to metal surfaces to provide surface etching, adhesion and ease when stripping.

72. "Prime coat" means the first of two or more coatings applied to a surface.

73. "Printed interior panels" means panels whose grain or natural surface is obscured by fillers and basecoats upon which a simulated grain or decorative pattern is printed.

74. "Refinishing" means the repainting of used equipment.

75. ‘‘Related cleaning’’ means the removal of uncured coatings, coating residue, and contaminants from:

    a. Miscellaneous metal and plastic parts prior to the application of coatings,

    b. Miscellaneous metal and plastic parts between coating applications, or

    c. Transfer lines, storage tanks, spray booths, and coating application equipment.

76. “Repair coating” means a coating used to recoat portions of a product that has sustained mechanical damage to the coating following normal painting operations.

77. "Resist coat" means a coating that is applied to a plastic part before metallic plating to prevent deposits of metal on portions of the plastic part.

78. “Roll coating” means a coating method using a machine that applies coating to a substrate by continuously transferring coating through a set of oppositely rotating rollers.

79. “Safety-indicating coating” means a coating that changes in a physical characteristic, such as color, to indicate unsafe conditions.

80. "Shock-free coating" means a coating applied to electrical components to protect the user from electric shock. The coating has characteristics of being of low capacitance and high resistance and having resistance to breaking down under high voltage.

81. "Silicone-release coating" means any coating which contains silicone resin and is intended to prevent food from sticking to metal surfaces such as baking pans.

82. “Solar-absorbent coating” means a coating that has as its prime purpose the absorption of solar radiation.

83. “Solid-film lubricant” means a very thin coating consisting of a binder system containing as its chief pigment material one or more of molybdenum disulfide, graphite, polytetrafluoroethylene or other solids that act as a dry lubricant between faying surfaces.

84. “Stencil coating” means a coating that is applied over a stencil to a plastic part at a thickness of one (1) mil or less of coating solids. Stencil coats are most frequently letters, numbers, or decorative designs.

85. "Texture coat" means a coating that is applied to a plastic part which, in its finished form, consists of discrete raised spots of the coating.

86. "Thin particleboard" means a manufactured board that is 0.25 inch or less in thickness made of individual wood particles that have been coated with a binder and formed into flat sheets by pressure.

87. "Tile board" means paneling that has a colored, waterproof surface coating.

88. "Topcoat" means the final film or series of films of coating applied to a surface;

89. "Transfer efficiency' 'means the portion of coating solids that adheres to the pleasure craft surface during the application process, expressed as a percentage of the total volume of coating solids delivered by the applicator.

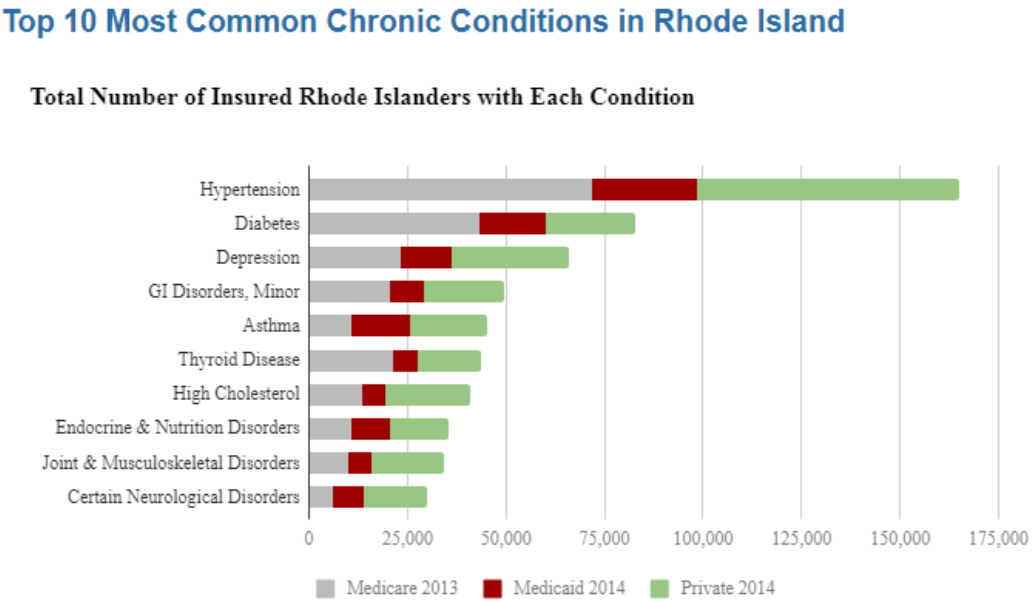
90. "Translucent coating'' means a coating which contains binders and pigment and is formulated to form a colored, but not opaque, film;

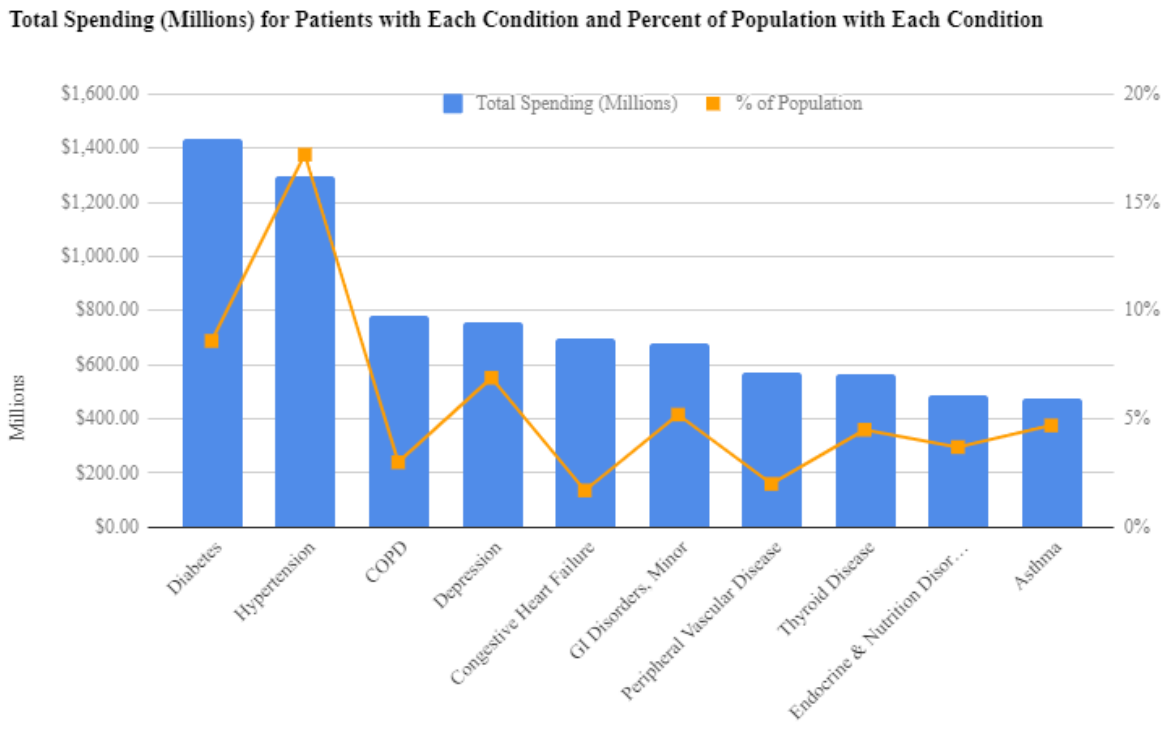
91. "Two-component coating" means a coating requiring the addition of a separate reactive resin, commonly known as a catalyst, before application to form an acceptable dry film.

92. ''Vacuum-metalizing coating'' means the undercoat applied to a substrate on which the metal is deposited prior to a vacuum-metalizing process or the overcoat applied directly to the metal film after a vacuum-metalizing process;

93. ''Vacuum metalizing process" means the process of evaporating metals inside a vacuum chamber and depositing them on a substrate to achieve a uniform metalized layer;

94. "Vinyl coating" means the application of a coating or coatings on a vinyl coated paper, vinyl coated fabric, or vinyl substrate or printing on vinyl-coated fabric or vinyl sheets.





Source: http://health.ri.gov/data/chronicconditions/

Appendix C: Benefits Assumptions Explanation

BENEFITS ESTIMATE ASSUMPTIONS		
Assumption	**Estimate**	**Explanation/Source**

EPA Annual National Benefit of .070 ppm standard in 2020	$ 12,082,033,234	Represents benefit of reduction of both VOC and NOx from 0.080 ppm standard to 0.070 ppm translated to 2018$; Low bound of most conservative meta-analysis; Source: 2008 RIA for NAAQS [Table 7.1(c)]
Ratio of VOC and NOx emissions Rhode Island: United States in 2017	0.16%	Scaling of nationally calculated benefit to Rhode Island by amount of emissions Rhode Island has recently seen compared to National emissions; Source: EPA Data Set "State Average Annual Emissions Trend"
Percentage of VOC emissions attributable to surface coatings in Region 1: New England	28%	Rhode Island is assumed to have an analogous distribution of VOC emissions sources by category as other New England states; Surface coating operations VOC emissions are most attributable the use of solvents in EPA's categorical breakdown of VOC emissions by industry; Source: EPA “Sources of Hydrocarbon and NOx Emissions in New England”
Applicability of Regulation to RI Sources	10%	Estimated percentage of sources that will be subject to regulation

Appendix D: Costs Breakdown by Year with and Without Discount Rate

Cost Benefit Analysis: 250-120-05-19

Costs	2019	2020	2021	2022	2023
Annual Costs	$ 60,000	$ 40,132	$ 8,388	$ 3,600	$ 3,600
Annual Costs Discounted at 7%	$ 60,000	$ 37,507	$ 7,326	$ 2,939	$ 2,746